REMARKS

Claims 1-13 and 18-20 are pending. Reconsideration in view of the above amendments and following remarks is respectfully requested. Claims 18-20 are newly added.

Applicants are pleased to note the Examiner indicated claims 3-9 would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims. Therefore, Applicants have amended claims 3 and 7 by incorporating all the limitations of the base claim 1 and thus Applicants submit that claims 3 and 7 and claims 4-6 and 8-9 which depend either from claim 3 or claim 7 are in form for allowance.

Claim Rejection – 35 USC § 102

Claims 1, 2, and 10-13 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Oshida et al. (US Pat. No. 4,862,008). Applicants respectfully traverse this rejection for at least the following reason.

The Office Action contends that Figure 4A in Oshida et al. shows all the elements recited in claim 1, and in particular an alignment system including an excitation source for producing electromagnetic radiation (reference light 501') to a surface of the substrate to induce a wave in a region of a buried substrate alignment mark (Fig. 14A and col. 11 lines 34+), and a measurement system to direct a measurement beam (reflected laser light 514). Applicants respectfully disagree.

Claim 1 recites, *inter-alia*, "an alignment system to align the substrate to the beam patterning structure, said alignment system comprising: an excitation source for directing electromagnetic radiation to a surface of said substrate so as to induce a wave therein in a region of an at least partially buried substrate alignment mark; and a measurement system to direct a measurement beam to be reflected by said surface and to detect surface effects caused by said wave thereby to perform an alignment to said substrate alignment mark."

In Oshida et al., the optical alignment system simply detects an alignment mark on a wafer through the exposing lens (TTL detection) of the projection system. A hologram is provided in one of the alignment irradiation means and the alignment detection means to compensate for wave front aberration of the exposure lens at the alignment wavelength (see col. 2, lines 17-31 in Oshida et al.), thus allowing the alignment light reflected by the alignment mark to be detected with a high focusing ability (see col. 2, lines 43-47 in Oshida et al.). Moreover, in Oshida et al., the alignment mark is not a buried alignment mark. Indeed, As shown in Figure 14A of Oshida et al. the alignment mark is etched on the bare

substrate (zero mark). However, in TTL (through the lens) alignment systems once a few process layers have been deposited or grown on the substrate, the zero marks etched on the bare substrate often become obscured and are no longer visible to the radiation used in the alignment process (see for example page 5 of the specification). In contrast, the alignment system recited in claim 1 allows achieving accurate alignment for process steps in a manufacturing procedure without accumulating overlay errors from earlier steps and without the need for clearout steps on layer covering the alignment mark and without the use of a hologram to compensate for aberrations in the projection lens as in the case of Oshida's alignment system. Consequently, Oshida et al. does not disclose, teach or suggest the subject matter recited in claim 1.

Therefore, Applicants respectfully submit that claim 1, and claims 2, 10-13 which are dependent from claim 1, are patentable and respectfully request that the rejection of claims 1, 2, and 10-13 under § 102(b) be withdrawn.

New claim 18 corresponds to claim 1 but further reciting the additional limitation "wherein said at least partially buried substrate alignment mark is buried in a process layer."

Therefore, for at least the above reasons, Applicants submit that claim 18 is patentable. Furthermore, Oshida et al. does not disclose, teach or suggest "said at least partially buried substrate alignment mark is buried in a process layer." The layer 43 (Fig. 14A) in Oshida et al. is merely a resist layer.

New claims 19 and 20 are dependent from claim 18. Therefore, for at least the above reasons, Applicants submit that claims 19 and 20 are patentable. Moreover, claim 19 further recites "said process layer comprises at least one of a conductor layer and a dielectric layer of a circuit pattern." Oshida et al. is completely silent about a process layer comprising at least one of a conductor layer and a dielectric layer. Similarly, Oshida et al. does not disclose, teach or suggest "said process layer comprises a plurality of process layers," as recited in claim 20. The layer 43 in Oshida is merely a resist layer and only one layer is used.

CONCLUSION

In view of the foregoing, the claims are now in form for allowance, and such action is hereby solicited. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, he is kindly requested to contact the undersigned at the telephone number listed below.

Attached is a marked-up version of the changes made to the claims by the current amendment. The attached Appendix is captioned **"Version with marking to show changes made"**.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in a condition for allowance and a Notice to that effect is earnestly solicited.

Respectfully submitted,

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Enclosure

APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims have been amended as follows:

3. (Amended) [Apparatus according to claim 1,] A lithographic projection apparatus comprising:

a radiation system constructed and arranged to supply a projection beam of radiation;

a support structure constructed and arranged to support beam patterning structure, the beam patterning structure serving to pattern the projection beam according to a desired pattern;

a substrate table constructed and arranged to hold a substrate;

a projection system constructed and arranged to project the patterned beam onto a target portion of the substrate; and

an alignment system to align the substrate to the beam patterning structure,

said alignment system comprising:

an excitation source for directing electromagnetic radiation to a surface of said substrate so as to induce a wave therein in a region of an at least partially buried substrate alignment mark; and

a measurement system to direct a measurement beam to be reflected by said surface and to detect surface effects caused by said wave thereby to perform an alignment to said substrate alignment mark,

wherein said excitation source is a laser constructed and arranged to emit pulses shorter than 1 nanosecond to induce an acoustic wave in at least one covering layer obscuring said substrate alignment mark.

7. (Amended) [Apparatus according to claim 1,] A lithographic projection apparatus comprising:

a radiation system constructed and arranged to supply a projection beam of radiation;

a support structure constructed and arranged to support beam patterning structure, the beam patterning structure serving to pattern the projection beam according to a desired pattern;

a substrate table constructed and arranged to hold a substrate;

a projection system constructed and arranged to project the patterned beam onto a target portion of the substrate; and

an alignment system to align the substrate to the beam patterning structure,

said alignment system comprising:

an excitation source for directing electromagnetic radiation to a surface of said substrate so as to induce a wave therein in a region of an at least partially buried substrate alignment mark; and

a measurement system to direct a measurement beam to be reflected by said surface and to detect surface effects caused by said wave thereby to perform an alignment to said substrate alignment mark,

wherein said excitation source is a modulated continuous wave source which is constructed and arranged to emit a harmonically varying beam of radiation so as to induce a thermal wave in the at least one covering layer obscuring said substrate alignment mark.

End of Appendix